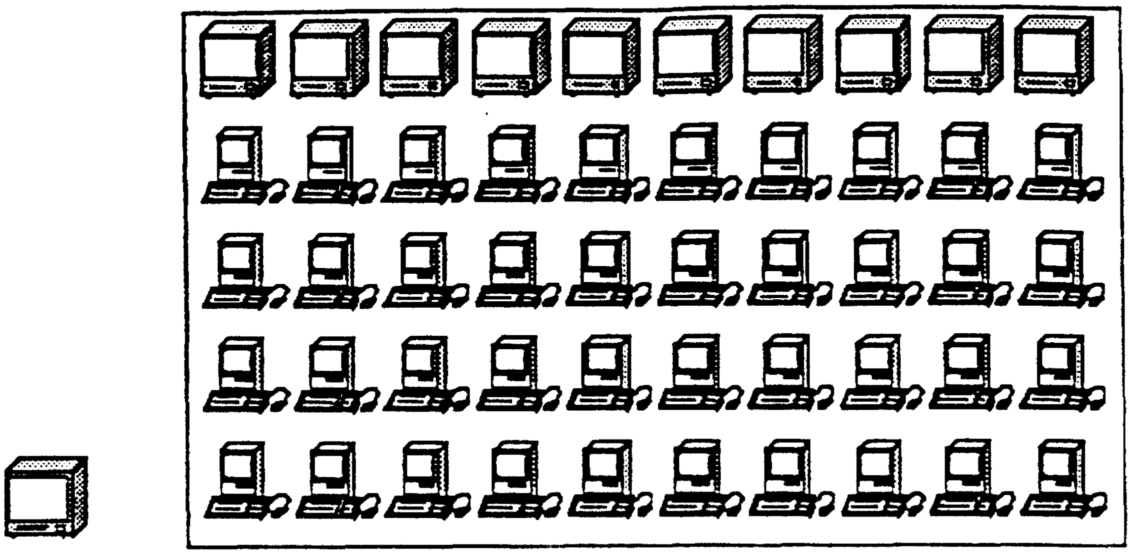

Figure 4-3 Present vs YES Networks Services

	Present Systems	YES Network
Recipients of Service	Schools, Businesses	Schools, Businesses, Individual Homes, Hospitals, Libraries
Receiver Antenna Size	8' diam.	2' diam.
Local Zoning for Antenna Dish	Very Restricted (Often Prohibitive)	Not Restricted (Preempted by FCC)
Types of Services	TV Lectures	TV Lectures, Computer Lectures, Written Materials, Teacher Aids, Remedial/Advanced Programmed Learning
Number of Simultaneous Courses in one Sat. Chan.	One (Possibly Two)	15 TV Lectures or 100 Computer Lectures or Combination
Satellite Transmission Cost of One Course	100 % (Reference)	7 % for TV Lecture 1 % for Computer Lecture
Flexibility of Service Offering	None	Complete Flexibility

Figure 4-4 Service Comparison Table

There is a great need for digital transmission capability, even in mainly analog systems. For example, the Los Angeles school system has announced its intent to initiate satellite services within the LA system. Officials there have indicated that they would like to use Scientific Atlanta's B-MAC analog encoding system simply because of the inclusion of a relatively low-rate data capability.

The MAC transmission systems (e.g., C-MAC, B-MAC, D2-MAC) were originally developed for commercial DBS transmission. They all use analog time-compressed component-video transmission which results in slightly improved video quality but increases the transmission bandwidth. Therefore, they still require an entire satellite transponder (channel) for each televised course. The only advantage of the MAC systems (over today's NTSC) in this application is the possibility of including some digital transmission capability which can be used for transmitting printed information.

The MAC video transmission system (like NTSC) is inherently rigid in its transmission format. Once you establish it, you're stuck with it (possibly for the next 30 years) as opposed to the all-digital **YES Networks**, which is inherently flexible and can change with the times and the needs for the foreseeable future.

Another system that has been examined by ACE is the NASA ACTS system. ACTS is a multiple-access time-division-multiplexed digital-transmission satellite. (It also includes an analog transmission mode which was not considered for this application.) ACE proposed system modifications to ACTS that would allow it to function as a viable means of serving segments of the Nation's educational needs by transmitting the Computer Course format previously described.

ACE also developed a system design for a less expensive receive-only ACTS terminal. However, ACTS is a spot beam system which is quite limited in its coverage area[1] and its receivers are inherently more complex and will always be considerably more expensive than the **YES Networks'** mass-produced DBS receivers.

ACTS is basically an experimental satellite which may not spawn commercially viable satellites until at least the late 90's. Each system (ACTS and DBS) has its advantages: ACTS for spot beam local area coverage (locally or remotely generated); the **YES Networks** (DBS) for Nation-wide coverage.

As we have seen in the above discussions, the **YES Networks** is the only known transmission system which can economically provide the large number of diverse educational services which will be

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[1] Mainly the large metropolitan areas--not the vast, presently under-served areas.

required to advance our Nation's educational system in the 1990's and beyond while providing quality education to all, regardless of location or local resources.

(4) Training and Installation

Anytime new technology is introduced into a non-technical environment, the questions of training and ease-of-use must be addressed. If a technology is not easy to use and provides only marginal benefit, it will simply be discarded and ignored. In the earlier decades of computer technology, a vast amount of training was necessary because humans had to change their mode of operation to conform to that of the computer. In the last few years that has radically changed. The introduction of personal computers into the mass non-technical market required that the human interface be given highest priority. Indeed, today's market will rapidly reject any software or system which is not "user-friendly."

The TV Courses will not require any special training of either the course originator of the classroom users because it operates in the same manner as any other TV system. However, the originating instructor should be aware that movies and visual scenes containing extended periods of rapid image changes may require prior arrangement with the YES Networks in order to insure high image quality for such transmissions. (This is a <u>course</u> lecture system. It does <u>not</u> supplant PBS.)

For basic computer courses reception, the user will not require any special training. One page of instructions will suffice. Computer literacy is not required. Many of the supplementary services will also require no special training because the computer will prompt the user to perform certain actions such as inserting or removing a floppy disc or making sure that the printer is turned on and has paper.

Some of the more advanced features (e.g., customizing downloaded exams) will require more interaction between the local teacher (or assistant) and the computer. However, the user-friendly graphics interface of today's Macintosh and Amiga computers (and later, IBM with Microsoft's OS-2 Presentation Manager) allows people with no previous computer experience to accomplish what is needed with little or no special training. The computer simply prompts the user for the necessary actions.

For example, experience has shown that secretaries with no previous computer experience and complete computer-phobia, when given a Macintosh computer and allowed to keep their typewriters (as a security blanket), abandoned their typewriters within a week.

No installation crew or training program is necessary at the school site, although it is anticipated that introductory seminars will be offered on a district basis. Therefore, the only limitation on the rate of system installations is how fast they can be manufactured and shipped. Installing the antenna is much easier than installing a TV antenna because it does not have to be on the building roof. In fact, the 2' antenna can be located indoors (for security reasons) and simply pointed through a window or a skylight.

The remaining training consideration is that of the computer course originating instructor. Part of the proposed software task is to generate a user-friendly interface for the originating instructor. Once the instructor has generated (or scanned) a set of presentation charts, the presentation will be no more complicated than using an overhead projector and a blackboard in a classroom. The only difference is that the instructor will be sitting down at a desk rather than standing in front of a class. Impromptu changes or additions (e.g., response to called-in questions) can be accommodated by real-time use of the scanner, sketch pad, and/or TV frame grabber (a device which freezes a TV image by digitizing it and storing it in computer memory). Training time for using this system is expected to be about one hour and requires no prior computer experience.

Most presentation materials are expected to be generated directly on the computer rather than being scanned. (The latter would still be used for pictures or previously generated materials.) In this case, familiarity with some of the many available software packages is desirable. This can be done off-line and most of it can be done by teaching assistants. However, just like any computer-phobe, once the instructor experiences the ease of computer-generated materials, manual preparations will be abandoned.

Use of more sophisticated presentation software (e.g., animation) is at the discretion of the instructor and can be done by a trained assistant. Because of the National scope of the course distribution, it is cost efficient to provide such assistants.

(5) The Plan

In order to implement the described system, a two year plan is proposed by ACE which will allow:

Simultaneous demonstration of a Computer Course and a TV Course (the latter using presently available, but expensive, codecs) through an existing satellite at the end of 12 months.
Demonstration of the new TV Course system at 18 Months.
Limited production of Computer Course receivers with trial service at 24 months.
Start of TV Course receiver production at 24 months.

The equipment to be provided by ACE is as follows:

One prototype transmitter and one prototype receiver for Computer Course transmission;

Multiplexing, demultiplexing, and interface equipment for simultaneous inclusion of a TV Course using commercially available (but considerably more expensive) codecs;

One prototype transmitter and one prototype receiver for TV course transmission.

The project is structured so that the initial twelve months will result in classroom demonstrations of operational equipment for Computer Courses. Specifications for TV Course production receivers will also be produced. During the second twelve months period, a TV hardware prototype will be constructed.

The relatively short schedule is possible because of previous experience, completed design work (e.g., an innovative digital demodulator, designed for integrated circuit implementation), and the deliberately robust system design, which allows many program elements to proceed in parallel before final integration. The majority of work may be done in southern California where a substantial pool of the required talents and other resources are readily available.

The top level PERT schedule for the project is shown in Figure 4-5 and the corresponding Gantt (task time-line) chart is shown in Figure 4-6. Each box shows the earliest start date and the calendar days duration of the task. Five sub projects are defined and are indicated by the boxes with the closed corners. The charts are mostly self-explanatory. However, the subprojects are summarized here.

The Computer Course Prototype task will provide transmission and reception to be used in the Computer Course demonstration. This task includes the demodulator, decoder, service selection, and basic timing modules that are also necessary for the TV Course Prototype. Simulation verification of the demodulator algorithm and generation of a demodulator LSI (Large Scale Integrated) circuit specification, which will be sent to manufacturers for chip quotations, are also included.

The Computer Course Software task consists mainly of generating the necessary control software to allow commercially available software to operate in a sequential or selective manner under the control of the Computer Course instructor. It also provides for the proper timing and sequencing of file transfers from the source computer to the destination computer and management and disposal of files in the destination computer. It is, in effect, the computer transmission operating system. The software task finishes with a computer-to-computer demonstration which uses the computer serial ports for direct communication and allows evaluation of the Computer Course concept.

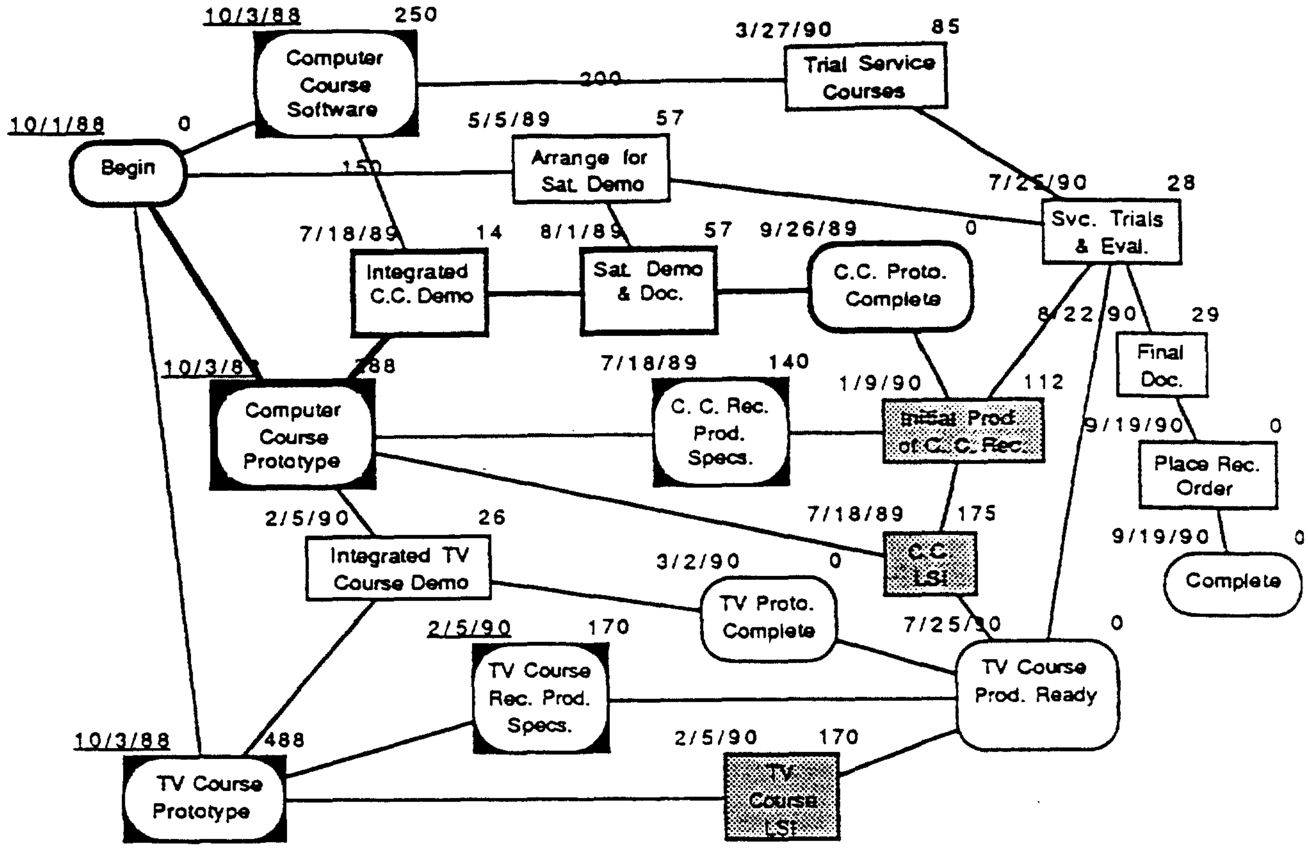

Figure 4-5 Top Level PERT Chart

After integration of hardware and software, a demonstration through an actual satellite link (C- or K_u-band) is planned. Both the University of Hawaii and GE Americom have volunteered to provide satellite time for system tests and for the demonstration. An additional subtask is provided for generating final production specifications and LSI implementation. Schedule time is allocated for a limited production run of Computer Course receivers.

The TV Course Prototype subproject will provide transmission and reception for demonstration of a TV Course. Specifications will also be generated for a set of LSI chips to be used in production of TV Course receivers. These specifications will be sent to manufacturers for chip quotations. An additional subtask is provided for generating final specifications for receiver production using LSI chips. Production of quantities of TV Course receivers is scheduled to begin near the end of the proposed program.

6. Conclusion

It is difficult at best to introduce new technologies and unique ideas - no matter how innovative and efficient they may prove to be. This must be done if educational resources are to be distributed uniformly with the greatest benefits.

Digital-based satellite communications can and will deliver educational programming more efficiently than current alternatives. New communications hardware using this technology will permit the transmission of many times the programming now available through analog delivery equipment. So great is the level of advance that only two channels could carry the educational broadcast burden for a national system. Two channels today, using hardware currently in place, would carry only two television programs or courses - far fewer than the tremendous array which would be potentially available on one channel using digital equipment with compressed signalization.

Solving the technological hurdles is but one major step toward the realization of effective national distribution of educational programming of the scope needed to revolutionize the nation's school systems. Equally important is the need to create a network of users who will pool resources utilized more efficiently through the new technology. Ultimately, such a network will embrace every public and private educational institution in the country as digital technology reduces the costs of participation. The networks will standardize scheduling, identify needs and develop programming, provide training, attract funding, and create a forum for the exchange of ideas and recognition of teaching excellence.

APPENDIX A Management

i. Project Design - The YES-P project is coordinated by the **Yes Networks, Inc.** (YES) with specific tasks allocated to the other partners. Although overall administrative responsibility is vested in YES, the Wilbur D. Mills Education Service Cooperative (WDM)[1] serves as the fiscal agent for the project. The tasks can be broadly divided into four areas: (1) administrative, (2) technical, (3) network design, and (4) assessment and evaluation.

Technical tasks involve principally the construction of specialized digital equipment for transmitting and receiving mathematics and science courses and the supporting operating system software. These are performed for the partnership by ACE. The technical tasks are reviewed by UTA and UH. The major responsibility of UTA and UH is to act as a technical liaison between the YES partners and the engineers at ACE who are constructing the digital satellite equipment, designing the operating system software, and with the assistance of the other partners, selecting available course software to be used in the classroom demonstrations.

The assessment tasks are effectuated among the other partners. The ASDE aids UALR in evaluating the instructional course material selected for the classroom demonstrations, and contributes to the development of an evaluation module to assess the results. The ASDE is recommending Chapter 1-eligible schools for implementation of the classroom test. YES is designing the organizational and financial plan for the user network, identifying its potential members, assessing its benefits, and characterizing the programming needs which it can meet.

<u>SUMMARY DESCRIPTION OF TASKS:</u>

1.0 <u>Administration</u>

Administration of the project provides efficient coordination and direction of all partners in assisting them to perform their respective task assignments. The project director has overall responsibility for this task and is aided by task leaders. This task provides liaison with the USDE and among the partners and advisors. Reporting, legal, accounting, public involvement (primarily coordinating and soliciting the cooperation of advisory groups and other interested parties who contribute to reviewing the project as it develops), and coordination in managing other tasks is

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[1] WDM is a recipient and administrator of grant funds, including funds from the United States Department of Education, for the benefit of twenty two predominantly rural public schools in Arkansas.

controlled through this activity. Assisted by counsel, the project director assures compliance with all necessary regulations, cost principles, and conditions of the grant. Financial administration is provided by the separate fiscal agent.

2.0 <u>Demonstration Equipment</u>

The purpose of this task is to manufacture digital transmission and receiving equipment for a demonstration of this technology in Chapter 1 schools.

Subtask 2.1 - Operating Software. This subtask will develop the software necessary to operate the hardware manufactured for the classroom demonstrations.

Subtask 2.2 - Transmitter Prototype. This subtask will develop the specifications for manufacturing the transmitter equipment, will produce a prototype transmitter, assemble the equipment and test the equipment prior to the demonstrations.

Subtask 2.3 - Receiver Specifications. The specifications for the manufacture of the receiver equipment will be produced.

Subtask 2.4 - Receiver Prototype. The receivers to be used in the demonstration will be manufactured, assembled, and tested.

Subtask 2.5 - Course Software Selection. Assisted by the other partners, particularly UALR, ACE will recommend the software for the classroom demonstrations. The software includes mathematics and science course materials suitable for demonstrations in the Chapter 1 elementary and secondary schools. A set of teacher instructions will also be developed.

Subtask 2.6 - Digital TV Specifications. Simultaneously with the development of the digital equipment for transmission and reception of the computer demonstrations, digital TV equipment specifications will be developed. Much of the process involved in the derivation of manufacturing specifications for the computer and TV applications is the same or very similar so that it is most cost-effective to develop them contemporaneously. At the end of the first project period (12 months) specifications for the compressed digital TV should be ready. During the second year of the project, a TV prototype will be manufactured and demonstrated.

Subtask 2.7 - TV Prototype. This equipment will be the major product from the second year of the project. No funding is provided for TV prototype manufacture during the first year.

Subtask 2.8 - Equipment Assembly and Service Trials. Equipment will be tested by ACE and the UTA engineering and TV research laboratory in Arlington. Field trials involving tests of satellite transmissions will be conducted jointly by ACE, UH and UTA prior to the demonstrations in test schools.

3.0 User Network Design

The user network is being designed by YES. The principal product will be a detailed plan for the creation of the network.

Subtask 3.1 - Review Existing Programs. Existing cooperative public and private educational programming and networking ventures will be examined to determine the extent of such activity nationally, and assess the strengths and weaknesses of current efforts.

Subtask 3.2 - Survey Of Users. A written survey instrument will be developed for assessing the attitudes of educators, manufacturers, potential users, and others toward the availability of educational resources. The written survey will be structured partly as a result of qualitative techniques such as focus group discussions to develop the issues which the quantitative written survey instrument is intended to explore more fully. Qualitative analysis techniques will be used also as a follow up to explore the implications and results of the written survey. Assistance from the EAB will be prominent.

Subtask 3.3 - Inventory of Needs. Based on the results of the surveys from subtasks 3.2 and the assessment conducted in 3.1, an inventory of educational needs which might be addressed by a user network will be compiled.

Subtask 3.4 - Network Design Characteristics. The inventory of needs will contribute to an assessment of the characteristics which would be desirable in a successful user network. The description of these characteristics will be reviewed by advisors to the project.

Subtask 3.5 Alternative Designs. Several alternative designs for a user network will be developed. Designs will include organization, funding, programming resources, coordination, scheduling, and other elements which a functioning network would have to include. These alternatives will be reviewed by the groups advising the the partnership and others.

Subtask 3.6 - Recommended Design. From the assessments and reviews described above, a recommended design for a network will be produced. The details of the design will be such that the creation of the network will require only the commitment of groups identified as necessary to implement the plan.

4.0 Assessment and Evaluation

The success and beneficial impact of the project will in part depend on credible evaluations of whether the objectives of the partnership are met. If the user network is to become a reality, and digital technology is to be introduced on a serious scale into the schools of America, the results of a successful demonstration must be reported accurately and impartially.

Subtask 4.1 - Hardware Evaluation. Several experts in satellite and computer hardware design have been assembled for work in the proposed YES-P project. Their responsibility will be to evaluate independently the ability of the technology to perform in a realistic demonstration. They will assist in the assembly, field trials, and testing of the equipment under classroom situations.

Subtask 4.2 - Chapter 1 School Selections. The Chapter 1 Schools coordinator for Arkansas, assisted by UALR, will recommend schools for implementation of the digital technology demonstration. These schools will be chosen to represent elementary and secondary schools, and although most will be characterized as Chapter 1-eligible, baseline, non-Chapter 1 schools (2 - 4 out of 20) will be selected for inclusion in the demonstration for comparison purposes.

Subtask 4.3 - Analytical Methodology. UALR will prepare an assessment module for evaluating the classroom demonstrations. The methodology will include both quantitative and qualitative approaches. The mastery of the operating instructions and assimilation of course material will be measured through performance times and achievement tests. The performance results of Chapter 1 schools students and teachers will be compared with those of non-Chapter 1 schools.

Subtask 4.4 - Review Teacher Training Instructions. UALR and ASDE assisted by advisory groups will review the instructions developed by ACE for use of the digital equipment in the classroom demonstrations to insure that they are clear, concise, and instructive.

Subtask 4.5 - Quantitative Analysis. The instruments measuring performance times and achievement will be administered during the classroom demonstrations and the results analyzed by UALR.

Subtask 4.6 - Qualitative Analysis. Issues raised by the quantitative analysis will be explored by UALR in focus groups and interviews as a follow up to the classroom demonstrations. Teachers involved in the demonstrations will meet with partners and project advisors.

Subtask 4.7 - Report on the Evaluations. The effectiveness of the project will be analyzed by all of the partners and advisors. The report will contain sections on technical analysis of the hardware and the utility of the technology in the classroom. Specifically, the major focus will be the results of the demonstration with Chapter 1 school students and their teachers.

ii. Management and Administration - YES is responsible for the administration of the project including management, liaison, direction of the work tasks, reporting and evaluation. However, the fiscal agent for the partnership is WDM. YES coordinates the work of the other partners. All administrative practices undertaken by YES on its own behalf and in behalf of the partners conforms to the cost principles and administrative provisions in the 34 CFR, Parts 74 and 75, <u>Education Department General Administrative Regulations</u> (EDGAR). Auditing of expenditures will be performed by Peat Marwick Main and Co., the largest international accounting firm. Legal counsel to assure compliance with the government regulations and cost principles is provided by Michael Brustein, Esquire, of Brustein and Manasevit, P.C., Washington, D.C.

YES will provide regular quarterly reports detailing progress toward task completion and outlining work expected to be performed during the next quarter. Copies of the reports will be available to the other YES partners and to the Executive Advisory Board (EAB). The EAB will contribute to evaluating the partnership's progress under the grant and offer other appropriate assistance and counsel.

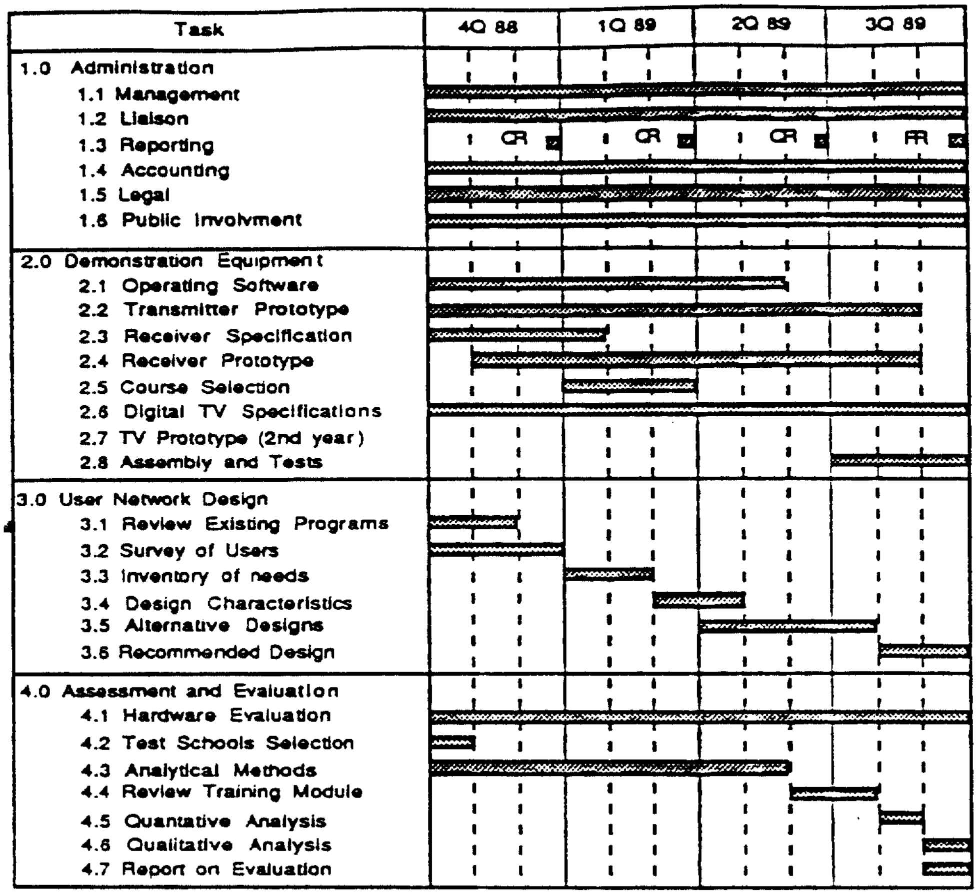


Figure A-1 Work Activity Flow Chart

iii. Project Objectives Related to Program Purposes - Clearly, the major focus of the program is to extend to educationally deprived students improved access to educational resources and benefits, and leave a legacy of innovative educational techniques. The ability to improve access, like most other issues in education, centers on financial resources.

The central aim of the YES-P project is to demonstrate how educational courses and materials may be disseminated more widely and at greatly reduced costs. More traditional, but less efficient, means of acquiring educational programming and materials will be supplanted by new technology, and a user network will coordinate resources to increase efficiency and utilization.

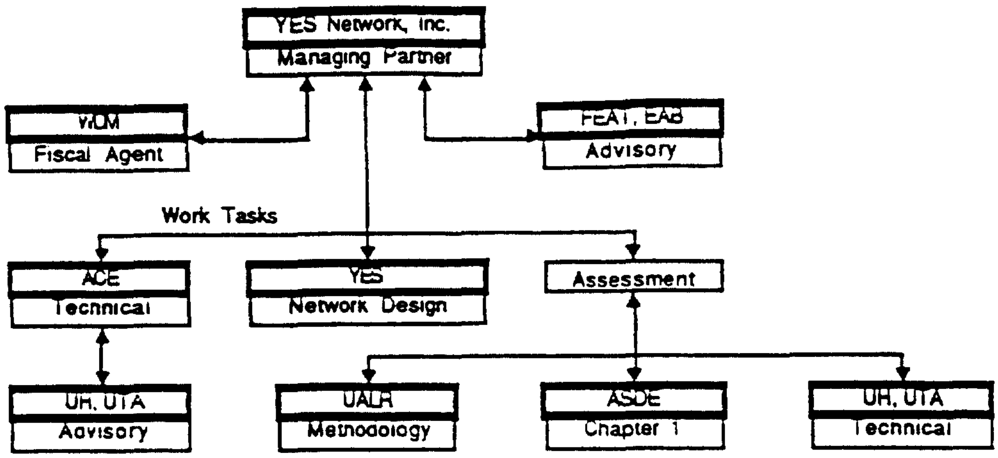


Figure A-2 Organizational Arrangements

Underserved and disadvantaged students will enjoy access to programming and instructional resources which would be considered superior by current standards in better-funded districts. This is especially true for precisely the types of instructional needs emphasized in the program - **mathematics, sciences, languages, and vocational courses,** because these lend themselves especially well to presentation through a television or computer-adapted medium.

iv. **Resources, Personnel, and Planning** - The YES-P has a division of responsibilities based on personnel qualifications to insure the most desirable distribution of resources for performing the project tasks. Tasks performed under the YES-P project are described above. The assignment of responsibilities, personnel, and funding to each task is further reiterated in each arrangement developed with the partners under the YES-P project.

The partners believe that the personnel assembled for each tasks have superior experience and qualification as demonstrated in the descriptions of their accomplishments.

The plan of work has been developed adequately to accomplish the project's objectives and sufficient resources have been allocated to perform the work tasks.

Provisions have been made for liaison and cooperation within the partnership, and extensive use of advisors is included. This should insure adequate public involvement and awareness of the project, contribute an invaluable additional resource of personnel th the project, improve planning, and guarantee a full, independent assessment of the project's benefits.

v. **Selection Plan** - Insofar as it is necessary to acquire services and materials outside of the partnership, the YES-P employes personnel and purchase supplies without discrimination on the basis of race, sex, handicap, or age. This is consistent with the personnel policies of the educational institutions who are partners in this project and of the YES Networks which has a non-discriminatory clause in its "Personnel Policies and Procedures.

vi. Evaluation Plan

(a). **Appropriateness** - The objective has been established for each task. Personnel, financial, and time resources are allocated to meeting objectives. A quarterly progress report will document resources expended, and describe accomplishments. This method is the most reasonable means of continually assessing project progress and demonstrating accountability. In addition, the EAB will review the project as it develops. Specific task products and milestones are scheduled. Their completion on schedule establishes a scale of progress which will be documented in quarterly reports.

b). **Objectivity and Generation of Quantifiable Data** - The Assessment and Evaluation task, discussed in the Plan of Operation, will generate quantifiable data. For example, the classroom test demonstration will measure for both students and teachers the appropriateness of the technology in a practical setting. Primarily, this will involve measuring their receptivity to the technology and its applications. These will be quantitatively evaluated through assimilation of instructions and performance times and the results of brief achievement tests.

The tests will involve both classes of Chapter 1 students who are traditionally underserved and classes of non-Chapter 1 students who have benefitted from adequate educational resources. Qualitative research, including focus groups and individual interviews, will be conducted as a follow up and complement to the quantitative methods to reveal issues either not apparent from test results or unexplained by the quantified data. The instruments and methodology will be developed by UALR as a major component of the Assessment and Evaluation Task.

vii. Meeting Program Priorities

(a) The YES-P project offers a major new opportunity to develop a network of users who will enjoy expanded access to existing **mathematics and science programming** as a result of introducing advanced digital satellite technology to schools on a national basis. This type of technology, involving computer and television applications, is readily adaptable to the types of programming appropriate to these instructional areas.

A major aim of the YES-P is to demonstrate a new communications technology which can demonstrably and dramatically reduce costs and make available educational resources to areas with high concentrations of **Chapter 1 students**. The hardware is very flexible. It can be used with existing microcomputer hardware likely to be found in schools along with the broad range of existing software packages available in the marketplace.

(b) The YES partners include educational institutions (UH/UM/KSU/UTA/UALR), a state agency (ASDE), private foundation educational interests (WDM/FEAT), and industry (YES/ACE). In addition, the Executive Advisory Board (EAB) consists of leading associations representing educational interests in America. All of the partners and the advisory organizations have assisted in the planning and development of the proposed YES-P project.

(c) Although the immediate purpose of the proposed project is to benefit selected Chapter 1 schools, it is recognized that the proposed network will be most effective if **all educational users** are included. These will not be limited to public and private primary and secondary schools, but will include educational agencies, industry, government, teacher training institutes, life-long education programs, libraries, conference and learning centers, vocational-technical schools, hospitals, and institutions of higher education. Individuals and families will ultimately participate through learning libraries and the direct reception of educational courses and materials.

(d) Three educational institutions are formal partners in the YES-P project: The University of Texas at Arlington (UTA), the University of Arkansas at Little Rock (UALR), and the Arkansas State Department of Education (ASDE), and three others are advisors: the U. of Hawaii, the U. of Miami Center for Interactive Learning and the Center for Rural Education and small schools at Kansas State University. Each has a significant role to play in implementing the project, and will commit significant resources in support of its successful implementation.

(e) The YES-P proposal will result in the creation of **teaching and training opportunities** for the useful life of the equipment and software utilized in the Chapter 1 school demonstrations. The equipment, teacher training plan, and software will remain in the participating schools after completion of the demonstrations. In addition to the approximately 2,000 students and teachers who will participate in the demonstrations, the equipment, instructional materials, and software can be used over a period of perhaps ten or more years to enrich the learning experiences of thousands of additional pupils and teachers. Another major component of the design of a user network for a digital-based telecommunications partnership will be a **continuing teacher training program**.

(f) The YES-P includes partners and advisory representatives from **Arkansas, Texas, California, Florida, Hawaii, Virginia, Maryland, New Jersey, Kansas, Missouri,**

New York, and the District of Columbia, and many national educational associations, and is **truly national** in scope.

(g) The major element of the user population who will benefit most from implementation of the YES-P project are **those traditionally excluded from careers in science and mathematics** because of inaccessibility and disadvantaged backgrounds. Educational resources made available for the training of these groups will be expanded through a reduction in costs afforded by new technology and the creation of a user network which will enrich programming, coordinate scheduling, and attract additional financial resources.

APPENDIX B Personnel

Dr. Samuel A. Covington - Project Director. Dr. Covington has over 20 years teaching experience in institutions of higher education where he has lectured in history, political science, human anatomy and physiology, wildlife management, and biology. He received BS and MS degrees in botany and microbiology (1967/1969) and MA and PhD degrees in history (1970/1976). He is presently a member of the graduate and undergraduate faculties of the University of Arkansas at Little Rock where he teaches history, environmental sociology and metropolitan planning. He was Director of Management planning for Metroplan, the Little Rock MSA regional council of governments, where he directed environmental planning projects and managed the council's public involvement programs. Also for the past five years he has been a consultant in private practice and president of Appraisal, Planning and Development Consultants, Inc. where he directs market and feasibility analyses for a wide range of clients including governments and industries. He has worked with many federal agency projects and programs in the past fifteen years including those regulated by the EPA, FmHA, EDA, Corps of Engineers, HUD, USGS, and F&WS. He has been project manager and grant administrator. Projects managed by Dr. Covington have included many involving complex arrangements among public and private interests. Dr. Covington has extensive experience in the areas of experimental radio and television programming, remote sensing (satellite and aerial photography), computer mapping, market analysis, and attitude sampling.

Dr. G. Gordon Apple - Manufacturer's Task Manager. Dr. Apple (President of ACE) received his BSEE degree from the University of Arkansas in 1966 and an MSEE and PhD from Purdue University in 1967 and 1970 respectively. He has over 20 years experience in digital communications beginning with a NASA research contract for implementation of a transform coding digital filter. He then worked at Bell Telephone Laboratories on digital interframe coding techniques for PicturePhone® transmission. At North Electric he headed up a group which developed transmission and synchronization systems for a new digital telephone switching system. He then was Director of Engineering for Automation Products Company. While at TRW, Dr. Apple was involved in many digital communication system projects including several satellites and modem and data compression systems. He served as system engineer on the Space Shuttle's primary communications system. He was then principal investigator and project manager for a contract with CBS Television for data compression for High Definition Television transmission via Direct Broadcast Satellites. He also served as assistant Program Manager for VHSIC-implementation of ground terminals for the MILSTAR satellite system. Dr. Apple has several patents in the fields of error correction coding, digital transmission, synchronization, and video data compression. He also has various publications and has made many presentations (including internationally) on these subjects. Dr. Apple is a Senior Member of IEEE, a member of Sigma Xi (research society), other honor societies, and the Society of Motion Picture and Television Engineers.

Mr. Donald K. Dement - Manufacturer's Technical Director. Mr. Dement is founder and president of Novacom, Inc., a consulting company which provides specialized planning, marketing, and design studies in direct broadcast satellite systems, technology, and applications, and chairman of Advanced Communications Engineering, Inc. He has over 30 years of practical experience in planning and management of engineering development in communications systems and technology. Presently, he directs a project team that is designing and developing an aeronautical satellite system. Mr. Dement has a long work history in the public sector, and many years of project management and contract administration. As NASA Headquarters' Director of Communications Programs, he planned the nation's new research and development efforts in satellite communications, specifically in applications of direct broadcast satellites and video compression. As Headquarters' Manager, Advanced Communications Research, he led NASA's advanced communications research program for five years. Additional work experience includes successfully managing a 600-person team as a Defense Department program manager to develop a major information processing system with a project budget of over $ 125,000,000. He is a member of many professional associations, a Senior Member of IEEE, and an associate fellow of AIAA. Among other awards and honors, he is a recipient of the Air Force Meritorious Civilian Service Medal.

Dr. John McElroy.-.YES-P Technical Advisor. Dr. McElroy is currently Dean of Engineering at the University of Texas at Arlington. He received his BSSE from the University of Texas at Austin and his MSEE and PhD in electrical engineering from Catholic University of America. Prior to joining UTA as the engineering dean, he was Vice President of Technology at Hughes Communications, Inc. (HCI), Los Angeles. At HCI he was Director of Galaxy Mobilestar, and chief technical adviser to the President of HCI, and managed advanced space systems studies for civil and national security applications. Between 1982 and 1985 he was Assistant Administrator for Environmental Satellite, Data, and Information Services, NOAA, Washington, D.C. At NOAA he directed the national program in civil, operational earth observations satellites. From 1980 to 1982 he was Deputy Director, NASA Goddard Space Flight Center, Greenbelt, Maryland. He was the general manager of this important NASA center, supervising the work of 25 to 30 missions in stages of development simultaneously. From 1966 to 1980 Dr. McElroy held various other positions with NASA including Director, Communications and Information Systems Research and Development Programs, and Chief, Communications Technology Division. He has many honors and scholarly publications to his credit and is a Fellow of the Washington Academy of Sciences, IEEE, and AIAA.

Assisting Dean McElroy will be Dr. Floyd Cash, Associate Dean of Engineering for Academic Affairs, and Mr. David Davis, Manager of Engineering Television.

Dr. Norman Abramson - Technical Advisor to the Partnership. Dr. Abramson received his A.B. degree from Harvard University, an M.A. from UCLA and Ph.D. from Stanford University. Dr. Abramson was assistant professor and then associate professor at Stanford University between 1958 and 1962. He was visiting professor, University of California, Berkeley, Harvard University, 1965-1966, and professor at the University of Hawaii since 1966. He was visiting professor at M.I.T., 1981-1982. He is Chairman of the Board, Technology Education Associates, Sidney, Australia, and a director of the Public Services Satellite Consortium, Washington, D.C. He is a member of the Pacific Telecommunications Council, and a consultant to the International Telecommunications Union, Geneva, Switzerland. He is a respected author (Information Theory and Coding, 1963) and editor (co-editor, Computer Communications Networks, 1973). Dr. Abramson is a Fellow of the IEEE, and holds numerous patents in telecommunications.

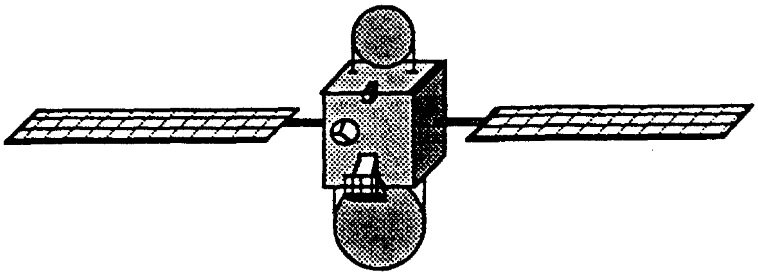
Dr. Robert H. Bradley - Principle Classroom Demonstration Evaluator - Dr. Bradley received his AB from Notre Dame (1968) and PhD in Educational Psychology from the University of North Carolina, Chapel Hill (1974). Since 1982 he has been Professor and Director of the Center for Research on Teaching and Learning at the University of Arkansas at Little Rock. Also, he serves as adjunct Associate Professor of Pediatrics at the University of Arkansas for Medical Sciences (1979-present). He has been a consultant with the Parent Education Project, Kentucky State University since 1985. He was a member of the Review Committee, Office of Special Programs, USDE from 1982 - 1987. In 1983 he was a member of the Review Committee on Research Priorities, National Institute of Handicapped Research, and a Test Reviewer, Buros Ninth Mental Measurements Yearbook. Between 1979 and 1984 he was a member of the Research Advisory Group, College of Nursing, University of Maryland. He has received many research grants from various federal agencies and has published widely in scholarly journals. He will be assisted by two additional members of the College of Education.

Mr. Bill M. Williamson - User Network Design Task Manager - Mr. Williamson has more than 25 years experience in assisting industry and government, educational institutions and economic development organizations in areas of marketing, market research, strategic planning and project management. He received his BSBA degree from the University of Southern Louisiana (1956) and his MS degree in Economics from Louisiana State University (1964). His career encompasses service as market analyst and sales forecaster with Ethyl Corporation, Senior Research Specialist with the University of Arkansas system's Industrial Research and Extension Center and Senior Management Consultant with the U. S. Department of Commerce's Mid-America Trade Adjustment Assistance

Center, currently operated by St. Louis University. As advisor to the State of Arkansas' Industrial Development Commission, he authored the concept and provided implementation planning for that state's currently operating Motion Picture Industry Development Program. Mr. Williamson has authored more than 50 industry location analyses, resource development research reports, business feasibility studies and development concepts, including an advanced educational development concept for the Fulbright Institute for International Relations.

Mr. Joseph F. Glass, Jr. - User Network Design Analyst - Mr. Glass attended the Naval Academy in Annapolis, Maryland and received his BA in Radio, Television and Film Production from San Francisco State University. Since 1985 he has been a consultant in private practice advising clients in video and broadcasting. From 1979 - 1985 he was employed by the Arkansas Industrial Development Commission as founding Director of Arkansas' Office of Motion Picture Development. He has extensive experience in stage, motion picture and video productions. From 1965 - 1969 he was employed by IBM specializing in applications and marketing of new equipment.

Mr. Bobby P. Kerr - Chapter 1 School Selection Coordinator - Mr. Kerr Coordinates the Chapter 1 Office for the Arkansas State Department of Education. He received his BS from Middle Tennessee State College (1961) and his MA in Education Administration and Supervision from Memphis State University (1969). From 1966 - 1970 he was Title I, ESEA Director for the West Memphis School District. From 1970 - 1986 he was Supervisor for Title I/Chapter 1, of the Federal Programs Division of the Arkansas State Department of Education. Since 1986 he has been Chapter 1 Coordinator for the Department. He has received several federal grants for improving methods of evaluation under Chapter 1 programs. He has served on the Advisory Council for Technical Assistance Centers since 1978. He will be assisted by Virginia Clark and Patsy Hammond of the ASDE staff, and the teachers and administrative personnel of the demonstration schools.



Final Report: ACTS Educational Broadcasting

Submitted to: NASA ACTS Program
and Public Service Satellite Consortium

By: G. Gordon Apple, PhD
Advanced Communications Engineering, Inc.

April 30, 1988

Summary

Applications for the ACTS satellite in educational transmission and broadcasting are described. A specific ACTS experiment is proposed which uses a new concept in educational program delivery through personal computers to a receive-only terminal. A receiver architecture is described. Task-schedules and cost estimates are provided for developing and testing a prototype. The necessary modifications for ACTS terminal control software and MCS control software are identified.

Table of Contents

List of Figures